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HARD MATERIAL INSERT WITH POLYCRYSTALLINE DIAMOND LAYER

BACKGROUND OF THE INVENTION

The invention relates to a hard material insert with a planar polycrystalline diamond layer for a tool, in particular a drilling or chiseling tool for working rock.

Usually hard material inserts having a planar polycrystalline diamond layer (PCD) are formed from a PCD layer blank or by spark erosion cutting. Since material economies have a high priority, the PCD layer blank is laid in a mosaic-like manner in several planar hard material inserts, whereby sharp corners occur.

According to EP 628369, planar hard material inserts are segregated in a mosaic-like manner, whereby sharp corners occur, for manufacturing hard material inserts for a tool comprising a PCD layer blank.

According to US Patent No. 5,601,477, in a circular hard material insert having a planar polycrystalline diamond layer (PCD) that is rounded off transverse to the layer plane, whereby the cutting edge is specifically blunted. Segregated segmental hard material inserts of a PCD layer blank are not used.

According to US Patent No. 5,533,582, a segmental semicircular hard material insert has sharp corners in the layer plane. Sharp corners of this type result in excessive stresses and cause fissures.

SUMMARY OF THE INVENTION

The object of the present invention is to increase the load capacity of a segmental hard

material insert having a planar polycrystalline diamond layer.

This object is achieved, in accordance with the invention, by a segmental hard material insert for a tool having a planar polycrystalline diamond layer in the layer plane, a main cutting element with at least segment radius R and an opposing, at least segment straight contact edge, wherein in a transition zone, of the main cutting element to the contact edge, the least radius of curvature K is greater than R/20 and less than R/5.

Sharp corners in the layer plane are avoided by virtue of the specific maximum curvature in the transition zone, of the main cutting element to the contact edge, in the least radius of curvature K being $K > R/20$, wherein superelevation of stress by point loads and the probability of cracking in the brazing layer between the tool and the contact edge are reduced. As a consequence, the load capacity of a hard material insert is increased.

Preferably, relative to the radius R of an at least segmental circular PCD layer blank and at least parts of the main cutting element, the width W of the contact edge lies in the range of R/2 to 2R, wherein the main cutting element is formed by an arc of the circumference of an at least segmental circular PCD layer blank having the radius R and the contact edge by virtue of a technically economical, essentially straight linear separation cut through the PCD layer blank.

Preferably, relative to the width W, the height of the hard material insert measured perpendicular to the contact edge is in the range of W/2 to 3W/2, wherein a bend-resistant, compact form is obtained.

Preferably, a scallop produced, for example, by spark-erosion cutting, more

advantageously disposed in a central zone, on the contact edge, since only the most minimal stresses occur on the contact edge welded to the tool in the zone of said scallop.

The transition zone of low curvature is preferably produced in a subsequent step by remachining after production of the PCD layer blank and separation of a segmental hard material insert, more advantageously by grinding, laser cutting or spark-erosion cutting.

SUMMARY OF THE INVENTION

The exemplary embodiment of the invention will be more completely described with reference to the drawings, wherein:

Fig. 1A, 1B shows a hard material, in accordance with the invention;

Fig. 2A, 2B shows a variant of the embodiment of Fig. 1A and 1B; and

Fig. 3 shows a further variant of embodiment of Fig. 1A and 1B.

DETAILED DESCRIPTION OF THE INVENTION

According to Fig. 1A, Fig. 1B, a segmental configured hard material insert 1 for a tool (not shown) has a planar polycrystalline diamond layer 2 deposited on a carrier layer 8. At a height H, a linear contact edge 4 of a length $W = 2R$ is arranged facing a discontinuous main cutting element 3 having an at least segmental radius R vis-à-vis the layer plane. The convex and concave transition zones X, X' formed within the discontinuous main cutting element 3 and facing the contact edge 4 are configured with rounded corners 5, whose radius of curvature

K = R/10. Of the circular (indicated in Fig. 1A by the broken line) or segmental circular (Fig. 1B) PCD layer blank 6 having the radius R, individual arc lengths L in the range of 0.3 πR are utilized without post-processing as part of the main cutting element 3, wherein the sum of the individual arc lengths L is in the range of 0.3 πR to 0.9 πR of the main cutting element 3 extending over a semicircular arch πR. In Fig. 1, the re-processed central part of the main cutting element 3 further forms a cutting radius R/2. A concave scallop 7 produced by spark-erosion cutting is disposed in a central zone ± W/4 from the center at the contact edge 4.

According to Fig. 2A, Fig. 2B, a linear contact edge 4 of the length W = 2R is arranged in a polycrystalline diamond layer 2 of the continuous semicircular main cutting element 3 having the radius R in the layer plane at height H, wherein the convex shaped zone X transitioning to the contact edge 4 formed in the layer plane is configured with rounded corners 5, whose radius of curvature is K = R/10.

According to Fig. 3, a linear contact edge 4 of the length W = R/2 is arranged in the polycrystalline diamond layer 2 of the continuous, spherical main cutting element 3 with a radius R opposite the layer plane at height H, wherein the convex transition zone X to the contact edge 4 is configured with rounded corners, whose radius of curvature is K = R/10.